

What is claimed is:

1. An electroplating solution useable for plating tin, lead or tin-lead alloy solder coatings comprising:

a sulfonic acid electrolyte;

at least one of a tin sulfonate salt and a lead sulfonate salt;

a non-ionic surfactant comprising an aromatic compound;

a grain refiner comprising a heterocyclic compound;

at least one brightening agent that is volatile at room temperature, and

at least one diol for reducing the volatility of the bath.

2. The electroplating solution of claim 1, wherein the brightening agent comprises an aromatic aldehyde.

3. The electroplating solution of claim 1, wherein the aromatic compound is a polyalkoxylated alkyl phenol.

4. The electroplating solution of claim 1, wherein the aromatic compound is octylphenoxy (10) polyethoxy ethanol.

5. The electroplating solution of claim 1 wherein the heterocyclic compound is selected from the group of substituted and unsubstituted lactones, cyclic imides, and oxazollines.

6. The electroplating solution of claim 1, wherein the heterocyclic compound is phenolphthalein.

7. The electroplating solution of claim 1, wherein the aromatic aldehyde is selected from the group consisting of chlorobenzaldehyde, methoxybenzaldehyde, the allyl ether of 2-hydroxybenzaldehyde, and derivatives of benzaldehyde which contain an electron donating group on the benzene ring.

8. The electroplating solution of claim 1, wherein the aromatic aldehyde is chlorobenzaldehyde.

9. The electroplating solution of claim 1, wherein the brightening agent comprises carboxylic acid.

10. The electroplating solution of claim 9, wherein the carboxylic acid is methacrylic acid.

11. The electroplating solution of claim 1, wherein the sulfonic acid electrolyte is selected from the group consisting of alkane sulfonate and alkanol sulfonate.

12. The electroplating solution of claim 1, wherein the at least one of a tin sulfonate salt and a lead sulfonate salt comprises a tin sulfonate salt and a lead sulfonate salt.

13. A process for electroplating a substrate with tin, lead or tin-lead alloys comprising the steps of:

providing an electroplating solution comprising a sulfonic acid electrolyte; at least one of a tin sulfonate salt and a lead sulfonate salt; a non-ionic surfactant comprising an aromatic compound; a grain refiner comprising a heterocyclic compound; brightening agents consisting essentially of an aromatic aldehyde and a carboxylic acid; and a diol;

positioning the substrate in the electroplating solution;

applying current; and

maintaining the temperature of the electroplating solution at a sufficiently high temperature so that the substrate is electroplated with a bright solder coating having a carbon content of less than about 0.1%.

14. The process of claim 13, wherein the diol comprises propanediol.